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ABSTRACT

Nine years after the 1973 oil embargo and the outpouring of educational materials and strategies developed in response to the energy crisis, the extent and content of energy education in the classroom were assessed. Seven thousand randomly selected teachers and principals were surveyed at the end of the 1981-82 school year (1000 each of elementary teachers, secondary science, social studies, mathematics, and home economics teachers, and elementary/secondary principals). About 20 percent of each sample returned the survey. Survey questions were grouped into 5 categories: extent of energy education; energy education methodology and content; school, district, and state administrative policies and their impact; attitudes (if energy should be part of the curriculum); and incentives and barriers. Responses from teachers and principals are discussed for each category. Selected results from the survey follow. About half of the teachers are presenting energy topics in their classes. Conservation, conventional/renewable resources and their production, and energy-environment interactions are the topics most often covered. That energy is not specified in a teacher's curricular responsibilities is the biggest barrier to implementation. As an inducement for teaching about energy, teachers ask for definite curricular requirements, more (and better) free and/or inexpensive materials, and encouragement from principals. (JN)

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ENERGY EDUCATION in the SCHOOLS

Results of a Survey of the Penetration of Energy Education into the Classroom

Janet A. White & John M. Fowler

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Results of a Survey of the Penetration
of Energy Education into the Classroom

by Janet A. White and John M. Fowler

Project for an Energy-Enriched Curriculum
National Science Teachers Association
January 1983

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ENERGY EDUCATION IN THE SCHOOLS

INTRODUCTION

Nine years after the 1973 oil embargo and the outpouring of educational materials and strategies that were developed in response to the energy crisis, the Project for an Energy-Enriched Curriculum of the National Science Teachers Association assessed the extent and content of energy education in the classroom. Seven thousand randomly selected teachers and principals were surveyed at the end of the 1981-82 school year--one thousand each of elementary teachers, secondary science, social studies, math and home economics teachers and elementary and secondary principals. Copies of the two surveys, one for principals, the other for teachers, can be found in the Appendix. About twenty percent of each sample returned the survey.

Responses were tallied in many different categories. In this summary of results, teachers' responses are most often reported according to whether or not they teach energy and according to grade level. Principals' responses are most often reported according to the amount of emphasis placed on energy education by their school district and according to grade level. Many other variables such as geographic region, community type and school enrollment were analyzed. They caused no significant differences in the results of the survey except where noted.

Since the overall response was about 20% (ranging from a low of 15% for social studies teachers to a high of 28% for secondary principals), the possibility of nonresponse bias must be taken into account. Teachers and principals who are interested in energy education could have been more likely to return the survey than those who are not interested. In that case, the quantitative data on actual classroom practice might show greater penetration of energy education than has occurred in fact. However, the number of surveys returned by those who do not teach energy (elementary, 36%, secondary, 41%) strengthen the conclusion that these data reflect the real situation. Furthermore, data on motivations, needs and areas of possible improvement common to all groups would not be affected by such bias if it were present.

To use this observed sample data to represent the total population of teachers and principals (at a 90% confidence level), some allowance also must be made for sampling error or variation. The range of the margin of error depends on two factors--the size of the responding subgroup and the response percent. For example, about 900 secondary teachers responded to the survey. Depending on the portion of that group that made a specific response to a question, the statistical margin of error is ± 2-3%.

The survey questions were roughly grouped into five categories: the extent of energy education, its methodology and content, school, district and state administrative policies and their impact, attitudes, and incentives and barriers. We discuss the responses from teachers and principals under these headings in the following sections.

Energy education seems to have made remarkable progress in the past ten years. We hope this survey will contribute to its continued growth in the future.

SUMMARY

Energy education in the classroom is widespread and substantial. Well over half of the survey respondants teach energy. A median average of eight instructional hours is spent on energy, and it is generally infused into existing courses. Conservation, conventional and renewable resources and their production, and energy-environment interactions are the topics presented by the majority of teachers. The most popular school-wide activities related to energy are science and/or energy fairs, field trips and, at the secondary level, career days. Forty-three percent of elementary teachers and 60% of secondary teachers report that student knowledge and awareness of energy issues is poor.

Teachers create more than 60% of the supplementary materials they use to teach energy. This seems to be the product of several factors. One factor is the dissatisfaction with the treatment of energy in textbooks. Although almost half of those who teach energy use textbooks to do so, about 65% of all teachers find textbook coverage inadequate.

Another factor is a perceived lack of support. Nearly 60% of all respondants report little/no district emphasis on energy concepts/issues in curriculum policy or guides. About 70% of elementary teachers and 80% of secondary teachers perceive no emphasis from their principals.

It appears that those who teach energy do so primarily because they think it is important. Seventy percent of those who teach energy report personal conviction as a major incentive. The role of materials, although of major importance, received much less emphasis from this group.

Those who do not teach energy do not do so in part because it is not required. The major barriers to energy education for these teachers are the lack of course requirements on energy and that energy is perceived not to be as important as other items in the curriculum. The availability of good free and inexpensive materials would be a major incentive to 54% of this group.

Despite the perception of those who do not teach energy that energy is a relatively unimportant topic, more than 90% of all groups agree that topics like basic energy knowledge, energy problems and the future of energy should be part of every school's curriculum. These findings match the results of the 1978 National Assessment of Educational Progress survey of energy awareness among young adults.

The disparity between this overwhelming support and the implementation of energy education is marked throughout this assessment. The need for a formal mandate is obvious and would, of course, dramatically change energy education. However, implementation is proceeding without such a mandate. Principals' substantial support for energy education, reported in the survey, is not perceived by the large majority of teachers. Such support would be a major incentive to those who do not teach energy. This discrepancy between what principals report and what teachers perceive pinpoints principals as a central group through which to broaden energy education.

I. EXTENT OF ENERGY EDUCATION

The quantitative data on the penetration of energy education into the classroom are very encouraging. Fifty-eight percent of elementary teachers and 52% of secondary teachers present energy topics in their classrooms. As expected, a large proportion of secondary science, home economics and social studies teachers teach energy (science, 68%, home economics, 64% and social studies, 53%), while very few math teachers (18%) include energy in their courses. Neither the teachers' years of classroom experience nor the grade level they teach makes a significant difference in whether or not they teach energy.

Teachers spend an average* of eight instructional hours per year on energy. Given the difficulty of introducing new topics into the curriculum, this average is very encouraging because it seems to represent a significant investment of instructional time. This average also reflects the amount of control a teacher has over what is presented in his or her classroom. As later data show, most teachers include energy in their teaching because they think it is important, not because it is specified as part of their curriculum. The 8-hour average is not well defined, however, because it is not clear whether teachers counted class periods as "hours" or if they counted actual hours of instruction. Also the number of class hours varies enough that it is not clear what portion of total class time is spent on energy.

In keeping with the organization of most elementary schools in self-contained classrooms and most secondary schools in rotating classes, the median number of pupils receiving energy instruction was 28 for elementary teachers, 80 for secondary teachers.

*Eight hours is actually the median average which, given the spread of the data, was thought to be the most useful characterization.

II. METHODOLOGY AND CONTENT

Energy is generally taught within a course but not as a whole unit within a course (elementary, 54%, secondary, 69%). This method of teaching--often called "infusion"--is reflected in the number of hours spent on energy. There is little presentation of energy as a separate course (elementary, 11%, secondary, 2%). Of those who teach energy, 66% present energy topics within a course, but not as a whole unit, 33% present energy as a unit within a course, and 4% teach separate energy courses. (Obviously some teachers use several approaches.)

Despite emphasis on the interdisciplinary nature of energy studies, there is very little team teaching of energy (elementary, 14%, secondary, 9%). Its largest application is in secondary social studies and home economics classes.

Teachers' and principals' recommendations of how energy should be taught are fairly consistent with actual practice. Secondary principals recommend most highly that energy be integrated into various subject areas (62%). Elementary principals support almost equally infusion (46%) and a combination of approaches--infusion and presentation as a separate course--depending on grade level (50%). Secondary teachers recommend infusion most highly (58%); elementary teachers support a combination approach (infusion and a separate course) most highly (56%).

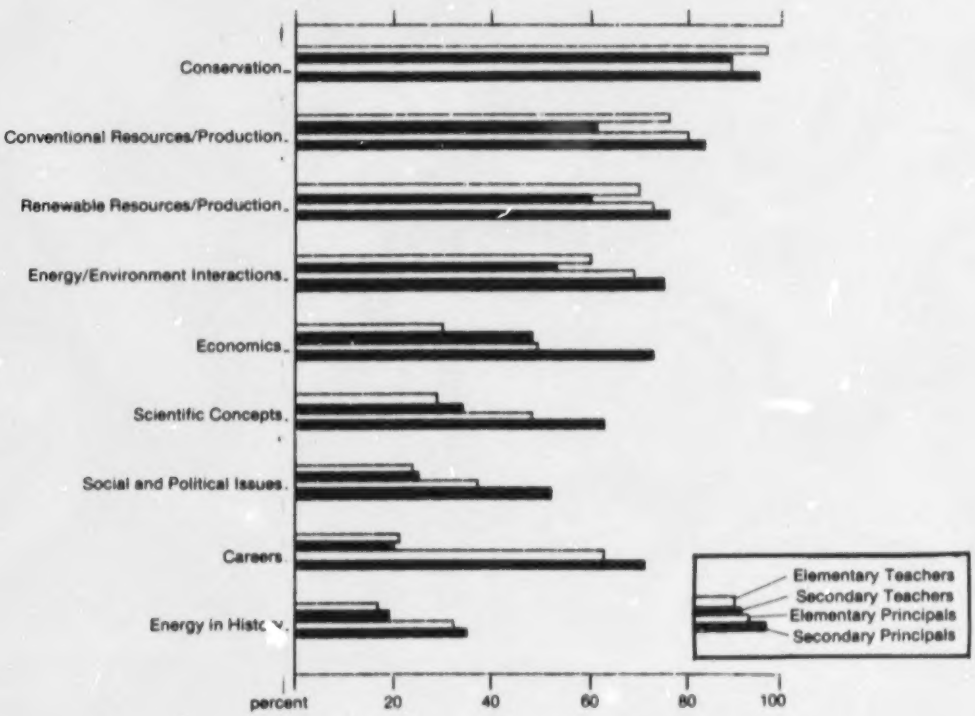
The most popular energy-related school-wide activities as reported by principals are science and/or energy fairs (elementary and secondary, 34%), field trips (elementary, 26%, secondary, 35%), and in secondary schools, career days that include careers in energy fields (30%). The emphasis on careers in high school seems appropriate. Ranked much lower were teacher workshops (elementary, 13%, secondary, 17%), student assemblies (elementary, 13%, secondary, 19%) and National Energy Education Day (NEED, elementary, 5%, secondary, 4%). Although NEED's rating was low, the regional variation of responses did reflect NEED's strongholds (8% in the Far West, 7% in the Northeast and Southeast). There was a high "no response" to this question (elementary, 35%, secondary, 23%) perhaps because budget problems have made supplementary activities like these impossible for many schools.

As shown in Table 1 and Figure 1, the majority of teachers include four main topics in their energy presentation: conservation; production and assessment of conventional and renewable resources; and energy-environment interactions.

Table 1: Topics Included in Energy Lessons

	Teachers		Principals	
	Elementary	Secondary	Elementary	Secondary
Conservation	96%	89%	89%	94%
Production & Resources				
Conventional	76	61	73	76
Renewable	70	60	80	83
Energy/Environment Interactions	60	53	69	75
Economics	30	48	49	73
Scientific Concepts of Energy	29	34	48	63
Energy-Related Social and Political Issues	24	25	37	52
Careers	21	20	63	71
Energy in History	17	19	32	35

Figure 1: Topics Included in Energy Lessons



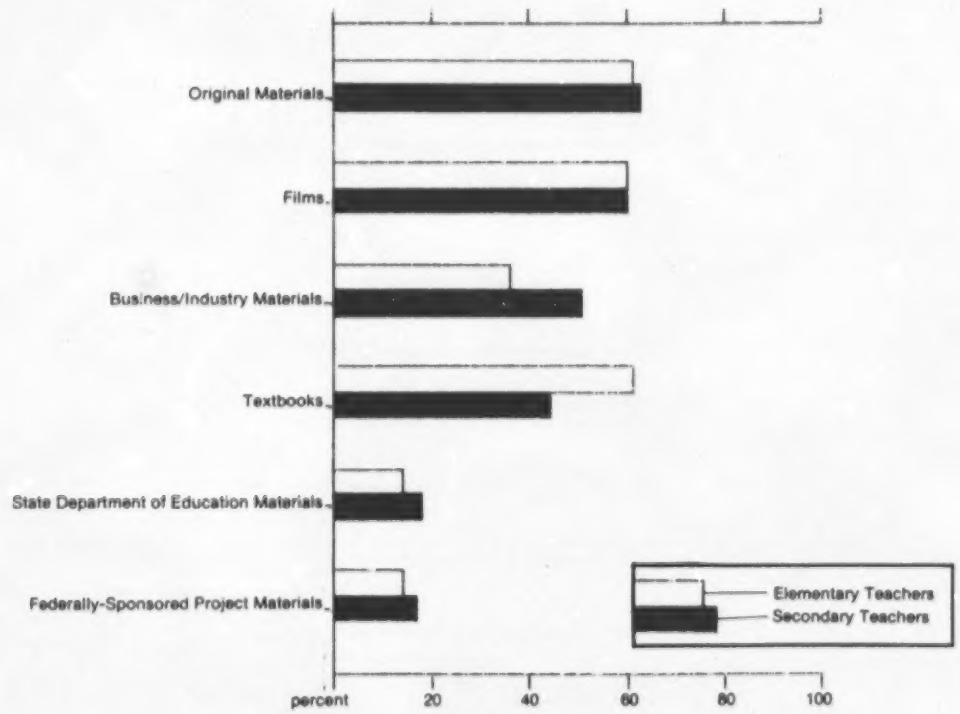
Conservation has been both the main thrust of many energy materials development projects and one of the most widespread results of the energy crisis. (For example, data from this survey show that most schools now have energy conservation management plans; see page 9.) Also as schools' fuel

costs have risen, funding has been diverted from instructional resources to pay the price (see page 10). Thus it is no surprise that conservation receives the greatest attention of the energy topics.

It is interesting to note that in secondary science, the teaching of the scientific concepts of energy ranks high (69%), but is fifth behind conventional resources and production (88%), conservation (83%), renewable resources and production (79%) and energy/environment interaction (75%). This is the heaviest emphasis on the scientific concepts of energy in any subject area or at any grade level.

Figure 1 shows that, like teachers, principals rate conservation, energy production and resources, and energy-environment interactions as the most important topics. However, principals give significantly greater support to the topics than teachers do, perhaps because it is easier to give abstract support to topics than to have to teach them. Finally, principals' interest in careers especially at the elementary level, is not reflected in the classroom performance of teachers.

Figure 2: Types of Materials Used to Teach Energy



A major portion of the materials used to teach these topics are produced by the teachers themselves. As shown in Figure 2, self-produced supplementary materials are used by 61% of elementary teachers and 63% of secondary teachers. Among elementary teachers, the use of self-produced materials is matched by the use of textbooks; however, among secondary teachers, textbooks are fourth after films and materials produced

by business/industry. Elementary teachers rank films close to texts and rank business/industry materials significantly lower. Most business/industry materials have been targeted for high school, which may account for the difference between grade levels in their use. The frequency with which teachers rely on their own materials reflects the level of personal commitment that teachers bring to energy (see page 13 for supporting data) and their dissatisfaction with existing materials, especially textbooks.

Teachers were asked to evaluate textbooks specifically because texts are widely used, long lived and because they reflect the standard content of curricula. Textbook coverage of energy was deemed inadequate by 55% of elementary teachers and 64% of secondary teachers; even among those who do not teach energy, 66% rated textbook coverage inadequate. A large proportion of teachers had no opinion on textbooks or gave no response (29% of those who do not teach energy, as might be expected; 19% of secondary teachers and 18% of elementary teachers; but only 11% of those who do teach energy), perhaps because they do not use or have not tried to use texts to teach energy topics. Textbook treatment of energy topics was labelled satisfactory by 14% of elementary teachers and 16% of secondary teachers. Among secondary teachers, satisfaction was greatest in science (24%) followed by social studies and home economics (16%) and math (7%). Given the reported level of dissatisfaction, the need for supplementary materials becomes clear.

III. ADMINISTRATIVE POLICIES AND THEIR IMPACT

Policies and practices that influence energy education already exist, as reported by principals in Table 2 below.

Table 2: Policies and Practices Supporting Energy Education that Currently Exist

	Districts With Strong Emphasis on Energy	
ELEMENTARY	Energy Conservation Management Plan	67%
	Curriculum Recommendations	46
	Conservation Incentives	30
	Educational Objectives	20
	Energy Education Committee	14
	Curriculum Requirements	11
	No Response	6
SECONDARY	Energy Conservation Management Plan	64%
	Curriculum Recommendations	53
	Educational Objectives	26
	Conservation Incentives	20
	Curriculum Requirements	19
	Energy Education Committee	13
	No Response	5

	Districts With Little Emphasis on Energy	
ELEMENTARY	No Response	38%
	Energy Conservation Management Plan	37
	Conservation Incentives	21
	Educational Objectives	15
	Curriculum Recommendations	13
	Energy Education Committee	4
	Curriculum Requirements	1
SECONDARY	Energy Conservation Management Plan	47%
	Curriculum Recommendations	30
	No Response	22
	Conservation Incentives	14
	Educational Objectives	12
	Energy Education Committee	4
	Curriculum Requirements	2

A wide discrepancy between curriculum recommendations and curriculum requirements is evident. Energy education seems to receive plenty of lip service without the kind of active, day-to-day support that assures its implementation. This discrepancy is borne out in later data which show overwhelming support for energy education in schools (more than 90%) undercut by two major barriers: that energy is not required in the curriculum and that it is not perceived to be as important as other items in the curriculum.

Apparently, energy conservation management plans are more widespread than energy education programs. Even in school districts that do not emphasize energy, 37% of elementary schools and 47% of secondary schools have such plans in place.

An outline of the effectiveness of the energy conservation management plans, their impact on energy instruction in the classroom and the effect of energy costs on resources for educational programs emerged from the survey responses.

When questioned about the effect of the cost of energy on the availability of resources for educational programs, about half of the principals of suburban elementary schools and urban high schools reported significant impact. In districts with strong emphasis on energy, 42% of elementary and 46% of secondary principals reported significant impact. In districts with little emphasis on energy, 47% of elementary and 50% of secondary principals reported only minor impact. It appears that districts that have been hit hardest by rising energy costs have responded most vigorously by developing energy management and education programs.

As Table 3 shows, principals and teachers who teach energy generally give a higher rating to the effectiveness of a school's energy management plan in conserving energy than teachers who do not teach energy.

Table 3: Opinion of the Effectiveness of Your School's Energy Management Plan

	Effective	Not Effective	Don't Know Results	Don't Know If School Has Plan	No Plan
Teachers					
Those Who Teach Energy	26%	21%	22%	17%	12%
Those Who Do Not	22	21	18	28	11
Principals in Districts With Strong Emphasis on Energy					
Elementary	71%	4%	14%	--	10%
Secondary	65	9	14	--	13
Principals in Districts With Little Emphasis on Energy					
Elementary	24%	11%	21%	--	43%
Secondary	33	12	19	--	36

Principals seem generally well informed about their schools' energy management plans and rate the effectiveness of the plans higher than teachers do. Among teachers it is interesting to note that more of those who teach energy do not know the impact of their school's energy management plan than those who do not teach energy. It cannot be reported, however, that those who do not teach energy are generally more well-informed than those who do: 28% of those who do not teach energy do not know if their school has a plan; only 17% of those who do teach energy do not know if their school has a plan.

The effect of a school's energy management plan on classroom energy instruction appears to be minimal. Fifty-four percent of all teachers report that their school's plan has provided no ideas or materials that have been used in lessons about energy. Principals in districts with little emphasis on energy concur with teachers: 49% report no ideas or materials for lessons provided by their school's energy management plan. It is ironic that so little crossover is achieved from these plans because energy conservation is the most frequently taught energy topic (see page 7). However, principals in districts with strong emphasis on energy perceive a much greater impact of school energy management plans on lessons about energy. Sixty-one percent of elementary and 56% of secondary principals report that their school's plan provided ideas or materials for classroom energy lessons. This perception runs counter to teachers' perception of the crossover effect, and is evidence of a break in communication that shows up at several different points in this survey.

IV. ATTITUDES

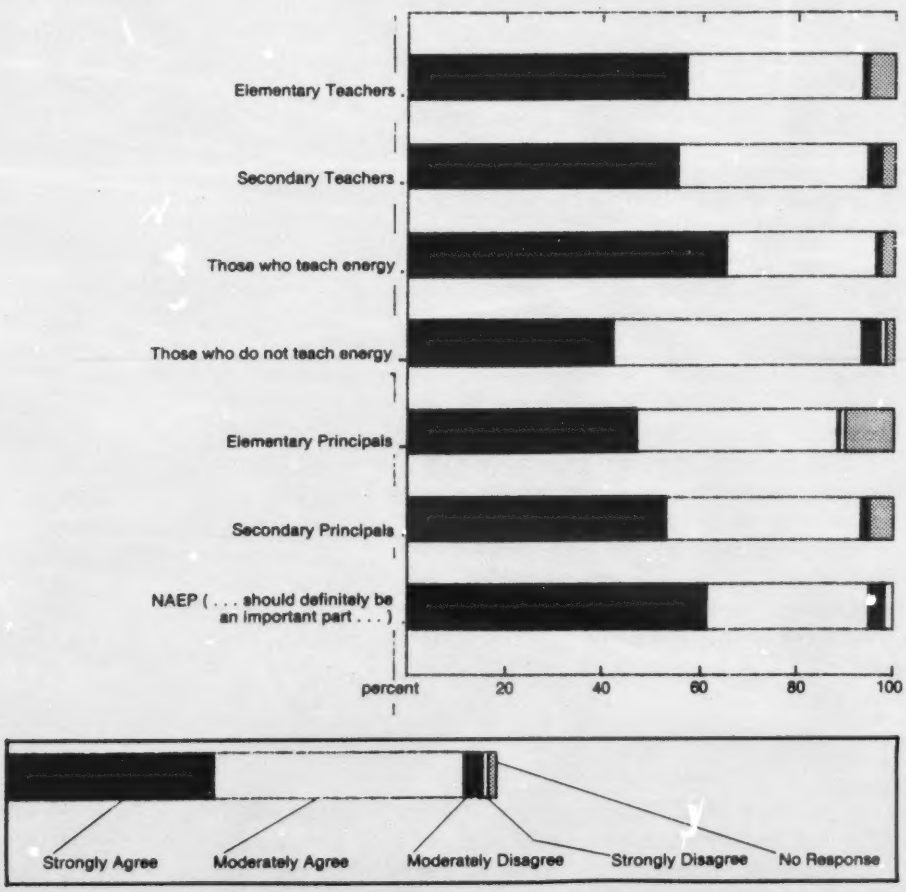
In 1978 the National Assessment of Educational Progress (NAEP) released the results of a national assessment of energy awareness among young adults, ages 26-35. One of the survey items was: "Topics like basic energy knowledge, energy problems, the future of energy, etc. should

definitely be an important part of every school's curriculum." Of the respondents, 95% agreed--61% strongly, 34% moderately.

Five years later, principals and teachers in the NSTA survey responded to a similar item: "Topics like basic energy knowledge, energy problems, the future of energy, etc. should definitely be part of every school's curriculum." The results were consistent with those of the NAEP. In strong and moderate agreement were 96% of those who teach energy and 93% of those who do not teach energy. (See Figure 3.)

The vast majority of principals also agree that energy topics should be part of every school's curriculum (elementary, 89%, secondary, 93%). Curiously, among elementary principals, 93% of those in school districts with little emphasis on energy are in strong and moderate agreement; only 87% of those in districts with strong emphasis on energy are in strong and moderate agreement. Secondary principals are more predictable: 95% of those in districts with strong emphasis agree strongly and moderately; 93% of those in districts with little emphasis agree strongly and moderately.

Figure 3: Energy Topics Should be Part of Every School's Curriculum



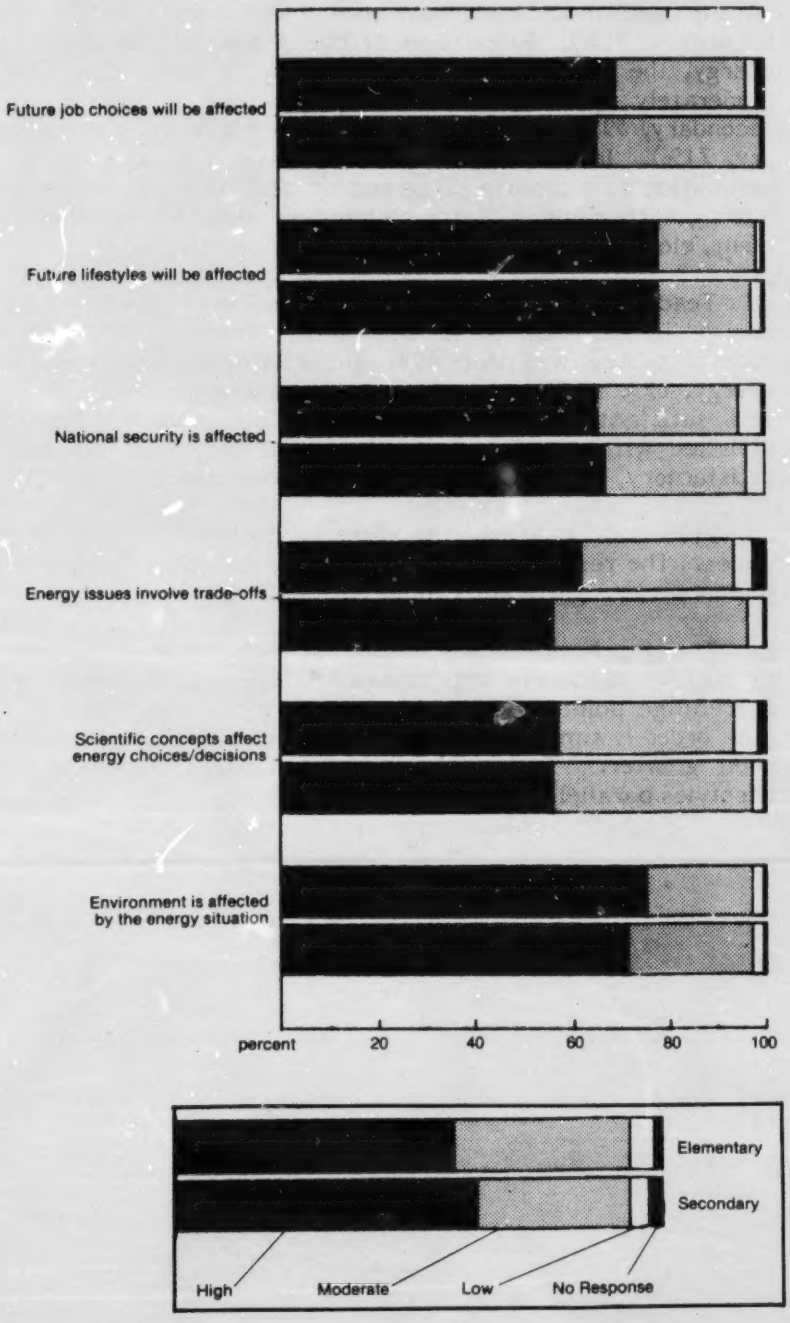
Principals were also asked to estimate the level of agreement of teachers and school boards on including energy topics in the curriculum. The majority of principals thought their teachers would only moderately agree (elementary, 71%, secondary, 75%). Estimation of total agreement (strong and moderate) was also lower than actual (elementary, 85%, secondary, 91%). Regardless of the degree of school district emphasis on energy, the majority of principals thought their school boards would only moderately agree (in districts with strong emphasis, elementary, 55%, secondary, 59%; in districts with little emphasis, elementary 66%, secondary, 71%). In school districts with little emphasis on energy, principals' estimation of moderate disagreement and strong agreement were very close (strong agreement, 12% for elementary and secondary, moderate disagreement, elementary, 11%, secondary, 8%).

Teachers were asked to assess students' knowledge and awareness of energy issues. Of those who teach energy, 50% said student knowledge/awareness was poor; 42% said satisfactory. Of those who do not teach energy, 67% said student knowledge/awareness was poor; only 20% said it was satisfactory. Elementary teachers seem to feel somewhat more satisfied with their students than secondary teachers (elementary: 48% satisfactory, 43% poor; secondary: 30% satisfactory, 60% poor).

Principals were asked to rate the importance to students of six energy issues. The results are shown in Figure 4. All six issues were rated highly important by significantly more than half the respondents.

The gap between the rating "of high importance" and the next lower rating, "of moderate importance," is quite large, ranging from 15 to 60 percentage points. In school districts with strong emphasis on energy, the rank order is similar and the support for the "of high importance" rating is even greater. The emphasis on the effect of energy issues on future lifestyles parallels the classroom emphasis on conservation.

Figure 4: How Important Is It That Students Have an Understanding of the Following Issues?



V. INCENTIVES AND BARRIERS

Teachers report that many factors provide varying degrees of incentive for their energy education efforts. Their responses are summarized in Table 4 below.

Table 4: Impact of Various Factors on the Amount of Time Devoted to Energy

	Those Who Teach Energy	
MAJOR	Personal conviction	70%
	Good free/inexpensive materials	38
	Increased student interest	36
	Better text treatment	30
MINOR	Increased student interest	34
	Better text treatment	31
	Inclusion in course requirements	26
LITTLE/NO	Increased encouragement from:	
	district administration	48
	school administration	47
	school board/community	44
	Help from other teachers	38
	Help from professional organizations	34
	Workshops on teaching strategies	32
	Those Who Do Not Teach Energy	
MAJOR	Inclusion in course requirements	58%
	Good free/inexpensive materials	54
	Better text treatment	47
	Increased student interest	41
	Increased encouragement from school administration	40
	Workshops on teaching strategies	39
	Personal conviction	38
	Increased encouragement from:	
	school board/community	38
	district administration	35
MINOR	Help from other teachers	38
	Help from professional organizations	34

From the data it appears that those who teach energy do so primarily because they think it is important. No other incentive is rated as highly as personal conviction. The role of materials, although of major importance, received much less emphasis from these respondents, possibly because they are not dependent on outside materials. As previous data showed, more than 60% of those who teach energy generate their own material. The role of student interest is not clearly defined by the data, perhaps because it is a factor not usually considered in curriculum development. Later data show

that although higher student interest would encourage those who do not teach energy, its lack is not a major barrier to energy education.

Those who do not teach energy do not do so, in part, because it is not required. These respondents emphasize the importance of course requirements: 38% said course requirements would be a major incentive and 57% report as a major barrier that energy is not specified in their curricular responsibilities.

The importance of materials was reflected by both groups. Good free or inexpensive materials was the second most important incentive, although its importance for those who do not teach energy was much greater than for those who do. Improved textbook treatment did not appear clearly as a major incentive.

It appears that the attitude of a school's principal could influence about half of those who do not teach energy. Principals seem to be aware of that influence as reflected in their perception of their role in providing incentives for energy education (see below). Support from the school district administration, the school board or the community is also important to those who do not teach energy. Those who do teach energy feel strongly that administrative support gives little or no incentive to their energy education efforts.

The reported impact of professional organizations seems consistent with the number of teachers who are members of those organizations. The apparent disinterest in getting help from other teachers is consistent with the low level of team teaching reported.

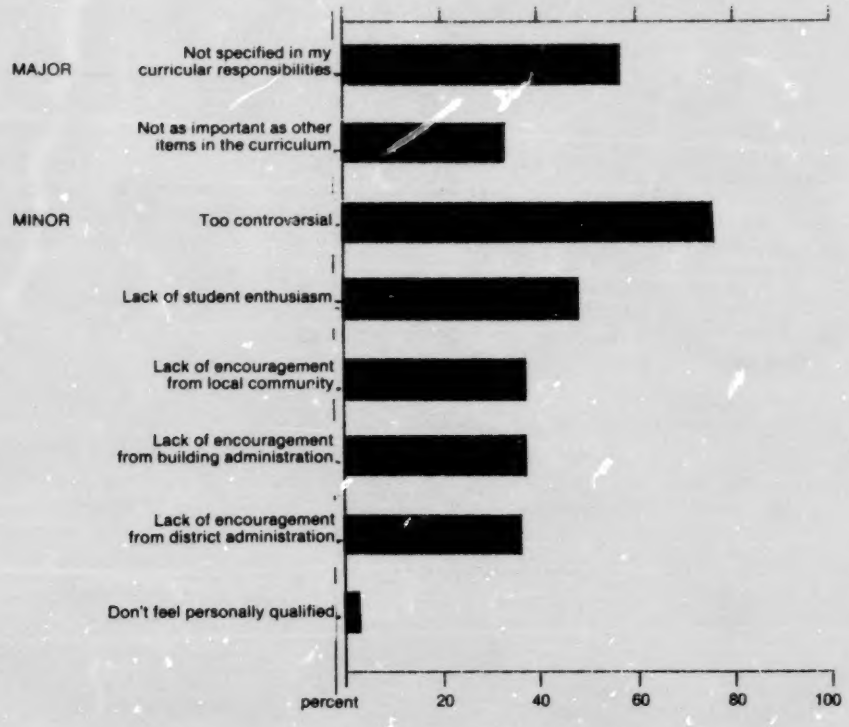
All principals rated four factors as the top major incentives for energy education. Regardless of the amount of district emphasis on energy, personal conviction was the first major incentive, with 80-86% of the principals concurring. The remaining incentives of the top four were increased student interest, increased encouragement from the principals themselves, and better materials (either better quality materials or greater availability of good free and inexpensive materials).

Encouragement from school district administration is a major incentive to more than half of all elementary principals and 48% of secondary principals in districts that give little support to energy education. In districts that strongly support energy education, secondary principals rank encouragement from district administration as important as the availability of good free and inexpensive materials (i.e., as one of the top four major incentives). This ranking seems to credit the attitude of the school district administration with the greater curricular emphasis on energy in these districts.

Help from other teachers is ranked as a minor incentive by about half of all principals except elementary principals in districts with strong emphasis on energy. These principals rank help from other teachers as a major incentive. This ranking supports the data on team teaching which is most frequent at the elementary level.

Barriers reported by those who do not teach energy were clearly defined as shown in Figure 5.

Figure 5: Impact of Various Factors on Teachers' Decisions Not to Include Energy in Their Curriculum



No items were reported as minor barriers. There was more agreement on the factors that were not perceived as barriers than on the major barriers. Again, curriculum crowding and curricular requirements are the main underlying problems. The incentives data supports this conclusion as does the wide support for infusing energy rather than presenting a separate course.

Although student interest was ranked as a major incentive, lack of student interest is definitely not an impediment. This ranking probably reflects the traditional approach to curriculum planning which does not consider the students' interest.

The perception that energy is not as important as other items in the curriculum is reported in sharp contrast to the overwhelming support for energy's inclusion in every school's curriculum. Ninety-three percent of those who do not teach energy agree that it should be part of the curriculum; yet one-third of this same group does not consider energy a priority topic.

Principals recognize that the lack of requirement or specification in teachers' curricular responsibilities is a barrier to energy education. Principals also seem to believe that teachers do not teach energy because they do not feel qualified. About half of all principals report these two factors plus lack of teacher enthusiasm to be major barriers.

The barrier posed by lack of requirement in the curriculum is perceived by both teachers and principals. However, the question of teachers' qualifications and enthusiasm are reported very differently by the two groups. Many teachers do not perceive their personal qualifications to be a major barrier; all principals rank it as one of the most influential major barriers. Those who do not teach energy report an increase in personal commitment to be one of the least influential major incentives; principals in districts with little emphasis on energy report lack of teacher enthusiasm as a major barrier. Even in districts with strong emphasis on energy, secondary principals are almost evenly divided on the role of teacher enthusiasm. Forty-six percent report it to be a major barrier; 44% report it to be a minor barrier.

These contrasting reports, combined with principals' low estimate of teacher support for energy education in general (pages 12-13), show again a lack of information exchange between principals and teachers.

Teachers perceive little support for energy education from their principals. Seventy-four percent of those who teach energy and 89% of those who do not, perceive little or no emphasis on energy from their building administrator. The bulk of the remaining teachers perceive moderate emphasis from their principals. These data, in conjunction with the importance of personal conviction and the strong support for energy education in general, seem to corroborate the assertion that teachers who want to teach energy do. Seen in conjunction with the response of 40% of those who do not teach energy, that encouragement from their school administrator would be a major incentive, the data seem to pinpoint principals as a primary group through which to broaden energy education.

Teachers' and principals' perceptions of the degree to which their school district emphasizes energy concepts/issues in curriculum policy and curriculum guides were, as Table 5 shows, more congruent.

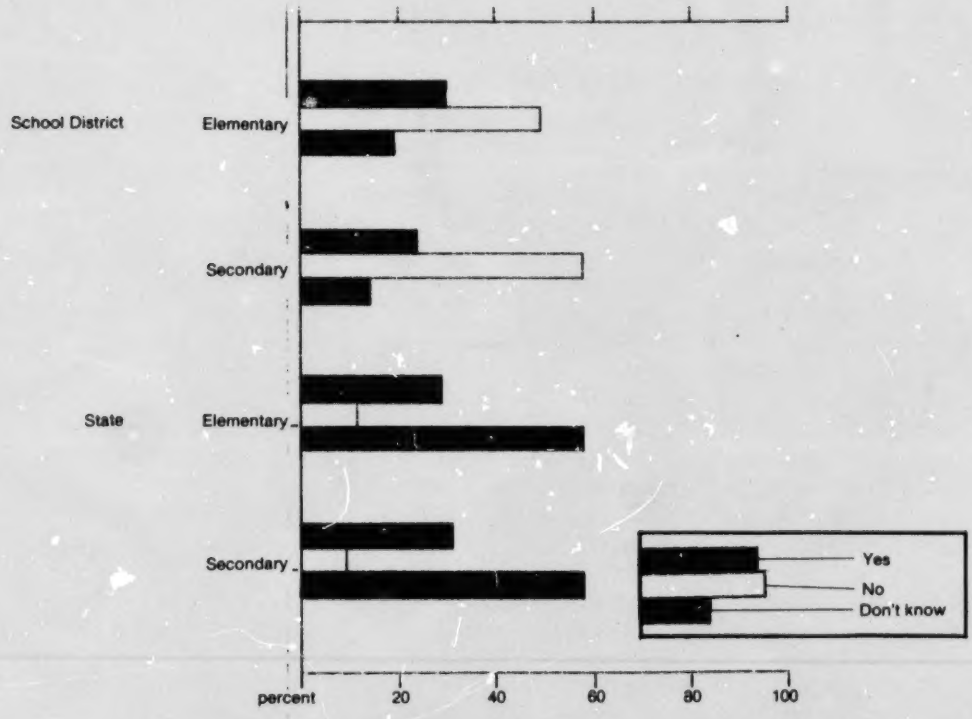
Table 5: Extent of School District Emphasis on Energy Concepts/Issues in Curriculum Policy and Curriculum Guides

	Little/No	Moderate	Strong	Don't Know
Teachers				
Those who teach energy	59%	23%	3%	12%
Those who do not teach energy	58	13	1	26
Principals (total)				
Elementary	40	38	12	6
Secondary	50	33	8	6
Principals (strong district emphasis)				
Elementary	—	76	24	—
Secondary	—	81	19	—
Principals (little district emphasis)				
Elementary	87	—	—	13
Secondary	89	—	—	11

Principals and teachers generally agree that little or no support for energy education is shown by most districts. Principals seem to perceive somewhat more support than teachers--their moderate and strong percentages are higher and the "don't know" response is much lower--perhaps because they are closer to the district administration than teachers are.

Principals' awareness of written policies supporting energy education in their school district and their state was assessed (Figure 6).

Figure 6: Written Policy Supporting Energy Education



Principals are well informed about district policies and much less informed about state policies. Principals in districts with strong emphasis on energy clearly know if their districts have a policy on energy education (the "don't know" response was about 10%), but are not familiar with state policy: about 44% answered "don't know" to the state policy question. Principals in districts with little emphasis followed the same pattern: about 72% of this group did not know what their state's policy on energy education is.

Administrative policies supporting energy education seem to exist in less than one-third of the states, according to principals. Yet about one half of the teachers are presenting energy concepts and issues in their classrooms. Energy education appears to be strong at the grassroots level, both in support and implementation.

CONCLUSION

Energy education seems to have made significant impact on public schools in just a few years. About half of elementary teachers and secondary science, social studies, home economics and math teachers are presenting energy topics in their classes. Energy is generally infused into existing courses and is studied for an average of eight hours--much more than a passing reference or an isolated one-day overview. Conservation, conventional and renewable resources and their production, and the interaction between energy and the environment are the topics most often covered. Teachers generally produce their own supplementary materials to teach these topics.

The disparity between support for energy education and its implementation is marked throughout this assessment. There is almost 100% agreement from the respondents that energy should be part of every school's curriculum. An understanding of some of the ramifications of our energy situation--that it affects job choices, life-styles, national security, etc.--is given heavy support by principals. Those who teach energy appear to do so because they themselves think it is important, not because it is mandated. But the need for a formal mandate is clear. That energy is not specified in a teacher's curricular responsibilities is the biggest barrier to implementation. It is not clear if the accompanying attitude--that energy is not as important as other items in the curriculum--is a result of the lack of requirement or a cause of that lack. Obviously if energy were a required part of the curriculum, it would be much more widely implemented.

In addition to the cumbersome process of adding energy to states' curriculum requirements, the disparity between support for energy education and its implementation could be addressed through principals. The difference between their perceptions and those of teachers, and the reported effect of administrative support on those who do not teach energy, pinpoint principals as important facilitators of energy education in individual schools.

To individuals and organizations who have been trying to infuse energy concepts and issues into school curricula, the survey results are clear. The schools offer a fertile field ready for cultivation. Education about the energy situation is recognized as important and student knowledge is seen as deficient. What teachers ask for as inducement to undertake this high priority task are definite curricular requirements, more (and better) free and/or inexpensive materials and encouragement from their principals. Principals believe that they do support energy education; they must be encouraged to effectively communicate their support to teachers.

It is hoped that the results of this survey will help energy education maintain the impressive momentum it shows. While these results are part of a report to the U.S. Department of Energy which contributed importantly to the growth of this momentum, little help can be expected from that source in the future. Teachers themselves will, no doubt, continue to be the most important resource. Administrators, professional organizations and the private sector must more effectively implement their support--"put their money where their mouth is"--to help teachers do this still important educational task.

SURVEY OF THE CURRENT STATUS OF ENERGY EDUCATION (principals)

This *Survey of the Current Status of Energy Education* is being conducted by the National Science Teachers Association. Although many energy education projects have been in existence since the early or mid-1970's and much material has been distributed, this survey will be the first attempt to gather national data on the nature and extent of the use of that material. This project will also help those responsible for energy education programs--curriculum planners, education specialists in industry and government, etc.--anticipate the attitudes and needs of teachers and principals as related to energy education.

This survey is being sent to randomly selected samples of elementary and secondary school principals. Its purposes are: 1) to measure the extent to which teachers now teach about energy environment/economics concepts and issues; 2) to determine the priority of energy education in teachers' and administrators' educational philosophies; and 3) to find out what actions, administrative support, materials, etc., would increase the number of teachers who deal with energy-related issues in their classrooms.

Response to the survey is entirely voluntary. It will take you only about ten minutes to complete. To be useful, however, the results must be received by Friday, May 28. Please complete the questionnaire whether or not energy education topics are currently being included in the curriculum of your school. Negative replies are as important as positive ones. Names and addresses are not required on the questionnaire; your response will be completely anonymous. The results of the survey will be reported in the NSTA newsletter *Energy & Education* in late 1982, and a copy of the report issue will be sent to you if you request it (see instructions at the end of the questionnaire). Reports will also be forwarded to all the appropriate newsletters and journals.

The National Science Teachers Association and the cooperating organizations listed here (*American Home Economics Association, American Petroleum Institute, Edison Electric Institute, Education Commission of the States, Joint Council on Economic Education, National Association of Elementary School Principals, National Association of Secondary School Principals, National Council for the Social Studies* and the *National Council of Teachers of Mathematics*) thank you for your attention to this request.

POLICIES AND PRACTICES RELATED TO ENERGY EDUCATION

1. Indicate below which of the following energy-related policies/practices currently exist in your school? *(Check ALL that apply.)*

   [1] ☐ Energy conservation management plan
   [1] ☐ Conservation incentives
   [1] ☐ Energy education committee
   [1] ☐ Curriculum recommendations
   [1] ☐ Curriculum requirements
   [1] ☐ Educational objectives written for different grade levels
   [1] ☐ Other *(please specify:* _____ *)*

2. Which of the following energy-related activities occurred in your school during this school year. *(Check ALL that apply.)*

   [1] ☐ Science and/or energy fairs
   [1] ☐ Workshops for teachers
   [1] ☐ National Energy Education Day program
   [1] ☐ Energy-related assemblies
   [1] ☐ Energy-related field trips
   [1] ☐ Career days *(including energy careers)*
   [1] ☐ Other *(please specify:* _____ *)*

3. Does your school district have a written policy supporting energy education?

   [1] ☐ Yes [2] ☐ No [3] ☐ Don't know

4. Does your state have a written policy supporting energy education?

   [1] ☐ Yes [2] ☐ No [3] ☐ Don't know

5. In your opinion, is your school's energy management plan effective in conserving energy?

   [1] ☐ Effective
   [2] ☐ Not effective
   [3] ☐ School has plan but no personal knowledge of results
   [4] ☐ School has no plan

6. Has your school's energy management plan provided ideas, materials, etc., which have been used in lessons about energy?

   [1] ☐ Yes
   [2] ☐ No
   [3] ☐ School has no plan

7. To what degree does your school district emphasize energy concepts/issues in curriculum policy and curriculum guides?

   [1] ☐ Strong emphasis [3] ☐ Little/no emphasis
   [2] ☐ Moderate emphasis [4] ☐ Don't know

PERSPECTIVE ON ENERGY EDUCATION

1. Using the codes provided, indicate below a) your level of agreement and b) your assessment of the level of agreement of the other groups listed with the following statement: *Topics like basic energy knowledge, energy problems, the future of energy, etc., should definitely be a part of every school's curriculum.*

   1-- Strong agreement 2-- Moderate agreement 3-- Moderate disagreement 4-- Strong disagreement

• Your level of agreement	[1] ☐	[2] ☐	[3] ☐	[4] ☐
• Your assessment of others' level of agreement:				
Teachers in your school	[1] ☐	[2] ☐	[3] ☐	[4] ☐
School board/community	[1] ☐	[2] ☐	[3] ☐	[4] ☐
Students	[1] ☐	[2] ☐	[3] ☐	[4] ☐

2. In your opinion, how important is it that students have an understanding of the following issues? *(Check one column for each issue.)*

	Degree of Importance		
	High	Moderate	Little or No
• Future job choices will be affected by the energy situation....	[1] ☐	[2] ☐	[3] ☐
• Future lifestyles and economic well-being will be affected by the energy situation.....	[1] ☐	[2] ☐	[3] ☐
• National security is affected by the energy situation.....	[1] ☐	[2] ☐	[3] ☐
• Energy issues involve social, political and economic tradeoffs.	[1] ☐	[2] ☐	[3] ☐
• Scientific concepts affect energy choices and decisions.....	[1] ☐	[2] ☐	[3] ☐
• The environment is affected by the energy situation.....	[1] ☐	[2] ☐	[3] ☐

3. How would you recommend that energy education topics be included in the curriculum? *(Check ONE only.)*

   [1] ☐ Taught as a separate course
   [2] ☐ Integrated into various subject areas
   [3] ☐ Combination of the two previous approaches depending on grade level of pupils

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PERSPECTIVES (Continued)

4. Which of the following types of energy education topics do you feel should be included in the curriculum? *(Check all that apply.)*

- [1] Energy conservation
- [2] Economics of energy
- [3] Energy/environment interaction
- [4] Renewable energy--production and resources *(solar, wind, bio, etc.)*
- [5] Conventional energy--production and resources *(coal, oil, gas, nuclear)*
- [6] Other energy-related social and political issues
- [7] Scientific concepts of energy
- [8] Energy in history
- [9] Energy careers
- [10] Other *(please specify: _____)*

FACTORS ENCOURAGING/DISCOURAGING THE TEACHING OF ENERGY EDUCATION

1. In your opinion, what impact would the following factors have on the decisions of teachers in your school to increase the amount of time devoted to energy education in the future? *(Please check one column for each factor.)*

	Degree of Impact		
	Major	Minor	Little or No
• Increased encouragement from district administration	[1]	[2]	[3]
• Increased encouragement from school administration	[1]	[2]	[3]
• Availability of good free or inexpensive materials	[1]	[2]	[3]
• Inclusion of increased or better quality energy education materials in commercial texts	[1]	[2]	[3]
• Increased encouragement from school board/community	[1]	[2]	[3]
• Increased interest on the part of students	[1]	[2]	[3]
• Examples and assistance from other teachers	[1]	[2]	[3]
• Assistance from local/national professional associations	[1]	[2]	[3]
• Workshops on teaching strategies to help with preparation	[1]	[2]	[3]
• Inclusion of topic in course material required for teachers' discipline/grade level	[1]	[2]	[3]
• Increase in teachers' personal convictions that energy education should have a high priority	[1]	[2]	[3]

2. Indicate below the degree to which each of the factors listed is an obstacle to increasing the amount of time spent on energy education topics in your school. *(Check one column for each factor.)*

Potential Obstacles	Major	Minor	Little or No
• Not specified in teachers' curricular responsibilities	[1]	[2]	[3]
• Teachers don't feel personally qualified	[1]	[2]	[3]
• Lack of student enthusiasm	[1]	[2]	[3]
• Lack of encouragement from district administration	[1]	[2]	[3]
• Lack of encouragement from building administration	[1]	[2]	[3]
• Lack of encouragement from local community	[1]	[2]	[3]
• Too controversial	[1]	[2]	[3]
• Not as important as other items in the curriculum	[1]	[2]	[3]
• Lack of teacher enthusiasm	[1]	[2]	[3]
• Other *(please specify: _____)*	[1]	[2]	[3]

BACKGROUND INFORMATION

1. In what state is your school located?

_____

2. What is the enrollment of your school?

_____ pupils

3. What is the enrollment of your school district?

- [1] Less than 2,500
- [2] 2,500-4,999
- [3] 5,000-9,999
- [4] 10,000-24,999
- [5] 25,000 or more

4. How many teachers are employed in your school?

_____ teachers

5. What is the grade span of your school? *(Circle grade span.)*

PK K 1 2 3 4 5 6 7 8 9 10 11 12

6. How would you describe the school district in which you are currently employed?

- [1] Urban
- [2] Suburban
- [3] Small town
- [4] Rural

7. Has the cost of energy adversely affected the resources available for educational programs in your school?

- [1] Yes, significant impact
- [2] Yes, but minor impact
- [3] No

** If you would like a copy of the report summarizing the results of this survey sent to you, provide your name and address on the enclosed label and return it with your completed questionnaire. Thank you for your assistance with this important study.*

Please mail the completed questionnaire in the enclosed envelope to:

NATIONAL SCIENCE TEACHERS ASSOCIATION

1742 Connecticut Avenue, NW, Washington, D.C. 20009

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SURVEY OF THE CURRENT STATUS OF ENERGY EDUCATION (teachers)

This *Survey of the Current Status of Energy Education* is being conducted by the National Science Teachers Association. Although many energy education projects have been in existence since the early or mid-1970's and much material has been distributed, this survey will be the first attempt to gather national data on the nature and extent of the use of that material. This project will also help those responsible for energy education programs--curriculum planners, education specialists in industry and government, etc.--anticipate teacher attitudes and needs related to energy education.

This survey is being sent to randomly selected samples of teachers. Its purposes are: 1) to measure the extent to which teachers now teach about energy environment/economics concepts and issues; 2) to determine the priority of energy education in teachers' educational philosophies; and 3) to find out what actions, administrative support, materials, etc., would increase the number of teachers who deal with energy-related issues in their classrooms.

Response to the survey is entirely voluntary. It will take you only about ten minutes to complete. To be useful, however, the results must be received by Friday, May 28. Please complete the questionnaire whether or not you have included energy education topics in your 1981-82 curriculum. Negative replies are as important as positive ones. Names and addresses are not required on the questionnaire; your response will be completely anonymous. The results of the survey will be reported in the NSTA newsletter *Energy & Education* in late 1982 and a copy of the report issue will be sent to you if you request it (see instructions at the end of the questionnaire). Reports will also be forwarded to all the appropriate newsletters and journals.

The National Science Teachers Association and the cooperating organizations listed here *(American Home Economics Association, American Petroleum Institute, Edison Electric Institute, Education Commission of the States, Joint Council on Economic Education, National Association of Elementary School Principals, National Association of Secondary School Principals, National Council for the Social Studies,* and the *National Council of Teachers of Mathematics)* thank you for your attention to this request.

CURRENT PRACTICES IN YOUR CLASSROOM

1. Are energy education topics part of the curriculum in your classroom for school year 1981-82?
(See item #6 below for listing of possible topics; EXCLUDE schoolwide assembly programs.)

[1]☐ Yes [2]☐ No **(If NO, please skip to Item #8)**

If YES to Item #1, please complete Items 2-7 AND THE REVERSE SIDE OF THIS FORM:

2. In what ways were the energy education topics included in your curriculum? *(Check all that apply.)*

[1]☐ Separate course [2]☐ Unit within a course [3]☐ Within a course but not a whole unit

3. Was the material taught in cooperation with someone from another discipline?

[1]☐ Yes [2]☐ No

4. Approximately how many class hours did/will you spend on energy education topics this school year?
_____ hours

5. Approximately how many total pupils were enrolled in classes in which you taught/will teach energy education topics this year?
_____ pupils

6. Please indicate below the types of energy education topics you included/will include in your curriculum for school year 1981-82? *(Check all that apply.)*

[1]☐ Energy conservation
[1]☐ Economics of energy
[1]☐ Energy/environment interaction
[1]☐ Renewable energy--production and resources *(solar, wind, bio, etc.)*
[1]☐ Conventional energy--production and resources *(coal, oil, gas, nuclear)*
[1]☐ Other energy-related social and political issues
[1]☐ Scientific concepts of energy
[1]☐ Energy in history
[1]☐ Energy careers
[1]☐ Other *(please specify:* _____ _____ _____*)*

7. Please provide information below on the types of materials you have used in teaching energy education topics.

a. Check each of the types of materials you have used.

[1]☐ Commercially-produced textbooks
[1]☐ Films
.....
Supplementary materials produced by:
[1]☐ Yourself
[1]☐ Other school district staff
[1]☐ State department of education
[1]☐ Federally sponsored project
[1]☐ Business/industry
[1]☐ Other *(please specify:* _____*)*

b. OPTIONAL: List the titles and sources of the two materials you you use most frequently.

• Title: _____
Source: _____
_____

• Title: _____
Source: _____
_____

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If NO to Item #1, please complete the following Item AND THE REVERSE SIDE OF THIS FORM:

8. Please indicate the influence the following factors had on your decision not to include energy education topics in your curriculum for 1981-82 by checking one box for each factor.

	Degree of Influence		
	Major	Minor	Little or No
• Not specified in my curricular responsibilities.....	[1]☐	[2]☐	[3]☐
• Don't feel personally qualified.....	[1]☐	[2]☐	[3]☐
• Lack of encouragement from district administration.....	[1]☐	[2]☐	[3]☐
• Lack of encouragement from building administration.....	[1]☐	[2]☐	[3]☐
• Lack of encouragement from local community.....	[1]☐	[2]☐	[3]☐
• Too controversial.....	[1]☐	[2]☐	[3]☐
• Not as important as other items in the curriculum.....	[1]☐	[2]☐	[3]☐
• Lack of student enthusiasm.....	[1]☐	[2]☐	[3]☐
• Other *(please specify:* _____*)*.....	[1]☐	[2]☐	[3]☐

OVER ➡

FACTORS ENCOURAGING THE TEACHING OF ENERGY EDUCATION

Regardless of whether energy education topics are part of the curriculum in your classroom for school year 1981-82, what impact would (or did) the following factors have on your decision to include/increase the amount of time devoted to energy education in the future? *(Please check one column for each factor.)*

	Degree of Impact		
	Major	Minor	Little or No
• Increased encouragement from school administration	1☐	2☐	3☐
• Increased encouragement from district administration	1☐	2☐	3☐
• Availability of good free or inexpensive materials	1☐	2☐	3☐
• Inclusion of increased and/or better quality energy education materials in commercial texts	1☐	2☐	3☐
• Increased encouragement from school board/community	1☐	2☐	3☐
• Increased interest on the part of students	1☐	2☐	3☐
• Examples and assistance from other teachers	1☐	2☐	3☐
• Assistance from local/national professional associations	1☐	2☐	3☐
• Workshops on teaching strategies to help with preparation	1☐	2☐	3☐
• Inclusion of topic in course material required for my discipline/grade level	1☐	2☐	3☐
• Increase in personal conviction that energy education should have a high priority	1☐	2☐	3☐

BACKGROUND INFORMATION

1. In what state is your school located?

   _____

2. What is the enrollment of your school?

   _____ pupils

3. What is the enrollment of your school district?

   1☐ Less than 2500 4☐ 10,000-24,999
   2☐ 2,500-4,999 5☐ 25,000 or more
   3☐ 5,000-9,999

4. How would you describe the school district in which you are currently employed?

   1☐ Urban 3☐ Small town
   2☐ Suburban 4☐ Rural

5. Check below all the grades that you are teaching this school year.

   01☐ Prekindergarten 08☐ Sixth
   02☐ Kindergarten 09☐ Seventh
   03☐ First 10☐ Eighth
   04☐ Second 11☐ Ninth
   05☐ Third 12☐ Tenth
   06☐ Fourth 13☐ Eleventh
   07☐ Fifth 14☐ Twelfth

6. How many years have you been teaching? *(Include the 1981-82 school year.)*

   _____ years

7. What is your opinion of the level of coverage of energy education topics in the commercial textbooks you are now using?

   1☐ Excellent 3☐ Inadequate
   2☐ Satisfactory 4☐ No opinion

8. Indicate below your level of agreement with the following statement: *Topics like basic energy knowledge, energy problems, the future of energy, etc., should definitely be a part of every school's curriculum.*

   1☐ Strong agreement 3☐ Moderate disagreement
   2☐ Moderate agreement 4☐ Strong disagreement

9. How would you assess your students' general level of awareness/knowledge of energy-related topics?

   1☐ Excellent 3☐ Poor
   2☐ Satisfactory 4☐ No opinion

10. How would you recommend that energy education topics be included in the curriculum? *(Check ONE only.)*

    1☐ Taught as a separate course
    2☐ Integrated into various subject areas
    3☐ Combination of the two approaches above depending on grade level of pupils

POLICIES AND PRACTICES RELATED TO ENERGY EDUCATION

1. In your opinion, is your school's energy management plan effective in conserving energy?

   1☐ Effective
   2☐ Not effective
   3☐ School has plan but no personal knowledge of results
   4☐ School has no plan
   5☐ Don't know whether school has a plan

2. Has your school's energy management plan provided ideas, materials, etc., which have been used in lessons about energy?

   1☐ Yes
   2☐ No
   3☐ School has plan but no knowledge of use in curriculum
   4☐ School has no plan
   5☐ Don't know whether school has a plan

3. To what degree does your school district emphasize energy concepts/issues in curriculum policy and curriculum guides?

   1☐ Strong emphasis 3☐ Little/no emphasis
   2☐ Moderate emphasis 4☐ Don't know

4. To what degree does your principal/assistant principal emphasize the need to include energy concepts/issues in the curriculum?

   1☐ Strong emphasis 3☐ Little/no emphasis
   2☐ Moderate emphasis

** If you would like a copy of the report summarizing the results of this survey sent to you, provide your name and address on the enclosed label and return it with your completed questionnaire. Thank you for your assistance with this important study.*

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